We claim:

1. A medical device comprising:

a substrate having a plasma polymerized functionality layer bonded to at least a portion of said substrate, said plasma polymerized functionality layer comprising a first plurality of functional groups; and

a superoxide dismutase mimic agent having a second plurality of functional groups complimentary to said first plurality of functional groups.

2. A medical device as in claim 1 wherein said first plurality of functional groups is selected from the group consisting of carboxylate, amine, and sulfate.

3. A medical device as in claim 1 wherein said first plurality of functional groups comprises of amine functional groups.

4. A medical device as in claim 1 wherein said first plurality of functional groups comprises of acrylic acid functional groups.

5. A medical device as in claim 1 wherein said first plurality of functional groups comprises of amine functional groups, wherein said second plurality of functional groups also comprises of said second amine functional group, and wherein a plurality of crosslinkers bonds said first plurality of functional groups said second plurality of functional groups.

Patent Pending

6. A medical device as in claim 5 wherein said plurality of crosslinkers comprises at least one of homobifunctional N-hydroxysuccinimide ester, disulfosuccinimidyl suberate, dissuccinimidyl suberate, bis(sulfosuccinimidyl)suberate, a bis imidoester, dimethyl pimelimidate, dimethyl suberimidate, dimethyl adipimidate, and dimethyl 3.3-dithiobispropionimidate.

7. A medical device as in claim 1 wherein said first plurality of functional groups comprises of carboxylate functional groups, wherein said second plurality of functional groups comprises of amine functional groups, and wherein said carboxylate functional groups bond to said amine functional groups.

8. A medical device as in claim 1 wherein said first plurality of functional groups comprises of acid chloride derivatives of carboxylate functional groups, said second plurality of functional groups comprises of amine functional groups, and said acid chloride derivatives bond to said amine functional groups.

9. A medical device as in claim 1 further comprising a plurality of polyethylene glycol functional groups wherein said first plurality of functional groups comprises of carboxylate functional groups, said second plurality of functional groups comprises of amine functional groups, , and said amine functional groups and said plurality of polyethylene glycol functional groups bond to said carboxylate functional groups.

Patent Pending

10. A medical device as in claim 1 wherein said first plurality of functional groups comprises of acid chloride derivatives of carboxylate functional groups, said superoxide dismutase mimic agent further having a plurality of polyethylene glycol functional groups, said second plurality of functional groups comprises of amine functional groups, and wherein said amine functional groups and said polyethylene glycol functional groups bond to said acid chloride derivatives of carboxylate functional groups.

11. A medical device as in claim 1 further comprises a polymeric insulation layer coated around said substrate wherein said plasma polymerized functionality layer is bonded to at least a portion of said polymeric insulation layer.

12. A medical device as in claim 1 wherein said substrate is formed at least in part of a polymeric material selected from the group consisting of a fluoropolymer, polytetrafluoroethylene, expaned polytetrafluoroethylene, polyolefin, high density polyethylene, polyimide, polyetherether keytone, polyimide, polyether urethane, polyurethane, polycarbonate urethane, siliconized urethane, and silicone rubber.

13. A medical device as in claim 1 wherein said polymerized functionality comprises a film having a thickness of about 25 nm to about 250 nm.

14. A medical device as in claim 1 wherein said medical device is a pacemaker lead having a component formed at least in part of said substrate.

Patent Application

15. A method making an implantable medical device comprising:

exposing at least a section of a component of said medical device formed at least in part of a polymeric material to a plasma to deposit a plasma polymerized functionality layer on said section of said component of said medical device; and

bonding superoxide dismutase mimic reactant having a complimentary functional group to said plasma polymerized functionality layer to said section of said component of said medical device

16. A method as in claim 15 wherein said plasma polymerized functionality layer comprises first functional groups which are selected from the group consisting of carboxylate, amine, and sulfate.

17. A method as in claim 16 wherein said first functional groups comprise of amine functional groups.

18. A method as in claim 16 wherein said first functional groups comprise of acrylic acid functional groups.

19. A method as in claim 16 wherein said first functional groups comprise of first amine functional groups, wherein said complimentary functionality comprises of

Patent Application

second amine functional groups, and wherein crosslinkers bond said first amine functional groups to said second amine functional groups.

20. A method as in claim 16 wherein said crosslinkers comprise at least one of homobifunctional N-hydroxysuccinimide ester, disulfosuccinimidyl suberate, dissuccinimidyl suberate, bis(sulfosuccinimidyl)suberate, a bis imidoester, dimethyl pimelimidate, dimethyl suberimidate, dimethyl adipimidate, and dimethyl 3.3-dithiobispropionimidate.

21. A method as in claim 16 wherein said first functional groups comprise of a carboxylate functional groups, wherein said complimentary functionality comprises of amine functional groups, and wherein said carboxylate functional groups bond to said amine functional groups.

22. A method as in claim 16 wherein said first functional groups comprise of acid chloride derivatives of a carboxylate functional groups, wherein said complimentary functionality comprises of amine functional groups, and wherein said acid chloride derivatives of said carboxylate functional groups bond to said amine functional groups.

23. A method as in claim 16 wherein said first functional groups comprise of a carboxylate functional groups, said complimentary functionality comprises of amine functional groups, said superoxide dismutase mimic reactant further having

Legal Technology

polyethylene glycol functional groups, and said amine functional groups and said polyethylene glycol functional groups bond to said carboxylate functional groups.

24. A method as in claim 16 wherein said first functional groups comprise of acid chloride derivatives of a carboxylate functional groups, said superoxide dismutase mimic reactant further having polyethylene glycol functional groups, said complimentary functionality comprises of amine functional groups, and wherein said amine functional groups and said polyethylene glycol functional groups bond to said acid chloride derivatives of a carboxylate functional groups.

25. A method as in claim 15 further comprises coating a polymeric insulation layer around said medical device wherein said bonding of said is superoxide dismutase mimic reactant to said plasma polymerized functionality layer is such that said plasma polymerized functionality layer is bonded to at least a portion of said medical device by bonding to said polymeric insulation layer.

26. A method as in claim 15 wherein said medical device is formed at least in part of a polymeric material selected from the group consisting of a fluoropolymer, polytetrafluoroethylene, expaned polytetrafluoroethylene, high density polyethylene, polyimide, polyetherether keytone, polyimide, urethane, polyurethane, polycarbonate urethane, siliconized urethane, silicon rubber, and silicon.

Docket Number

27. A method as in claim 1 wherein said bonding of said is superoxide dismutase mimic reactant to said plasma polymerized functionality layer is such that said polymerized functionality layer has a thickness of about 25 nm to about 250 nm.

28. A method as in claim 15 wherein said modifying of said medical device includes modifying a pacemaker lead.

29. A method as in claim 25 wherein said modifying of said medical device includes modifying a pacemaker lead wherein said pacemaker lead has a component formed at least in part of said polymeric insulation layer.

30. A medical device as in claim 1 further comprising an electrically conductive electrophysiology lead implantable in a patient's heart having said substrate.

31. A medical device as in claim 1 further comprising a pacemaker lead implantable in a patient's heart having said substrate.

32. A medical device as in claim 1 further comprising an electrical signal generator and an electrically conductive electrophysiology lead implantable in a patient's heart having said substrate.

Attorney's Docket No.